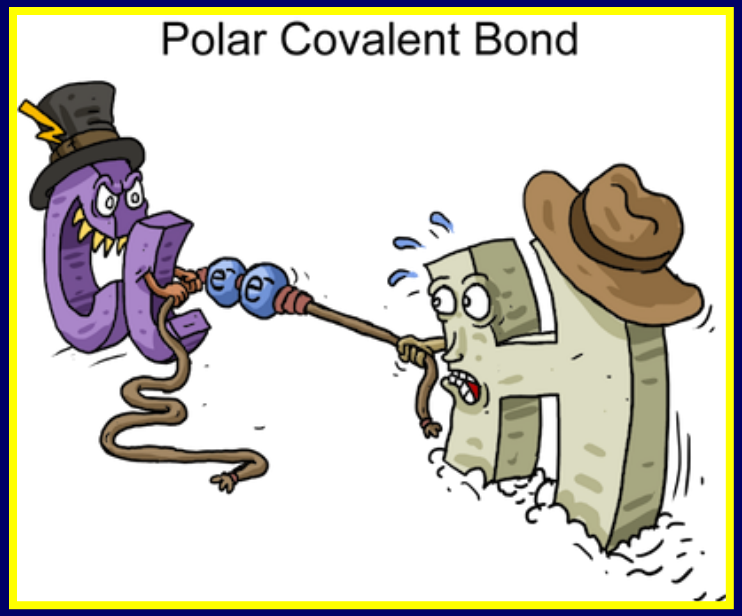
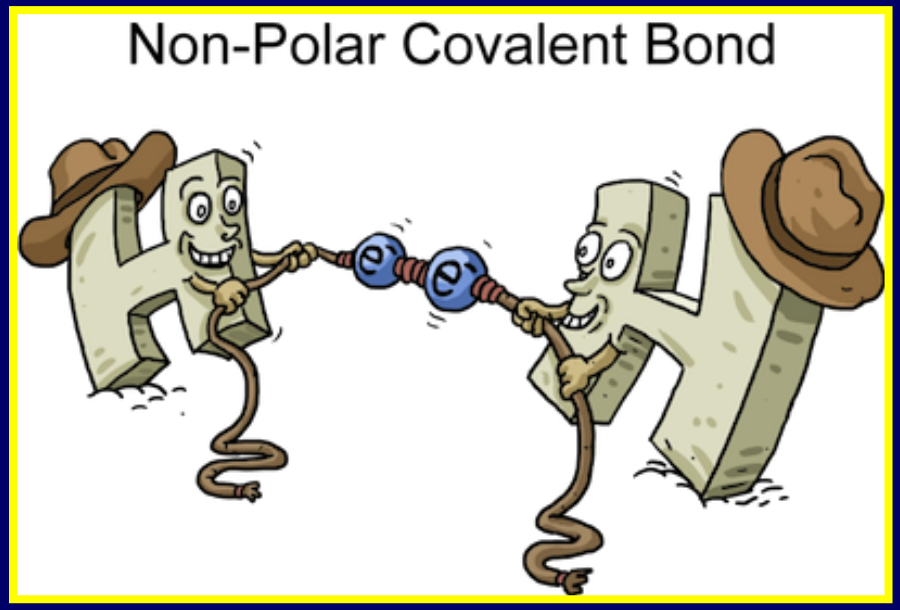
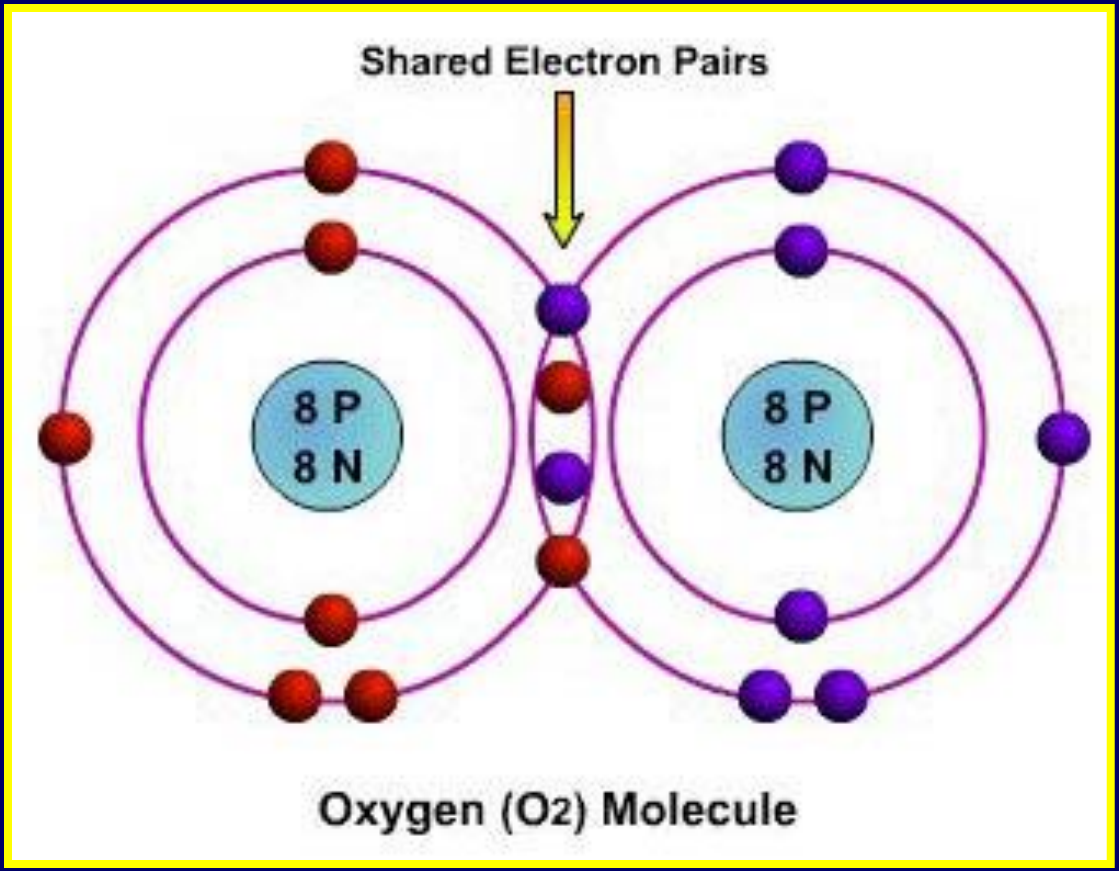
Polar and Nonpolar Molecules





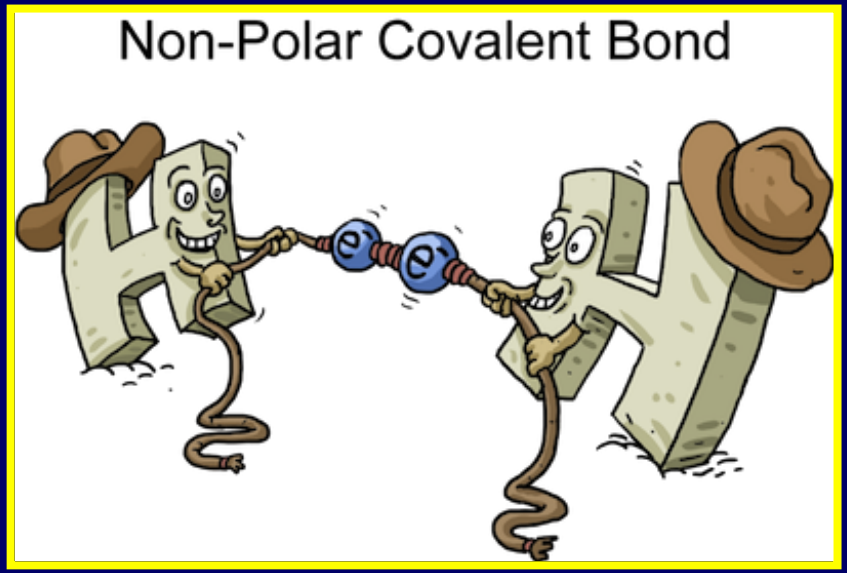
Covalent Bonds

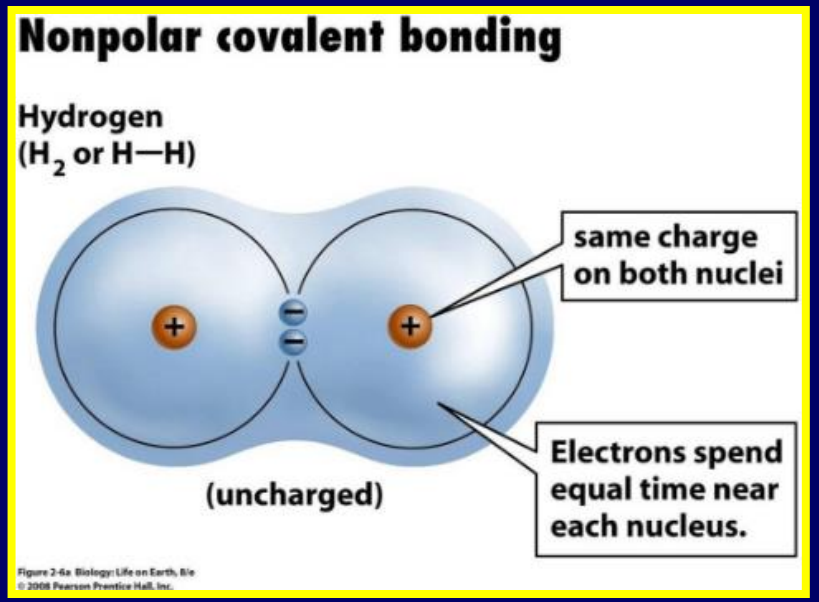
Non-metals form covalent bonds by sharing pairs of electrons to form covalent molecules.



Equal Sharing

Sometimes the atoms, especially if they are the same atoms, will share the electrons equally.

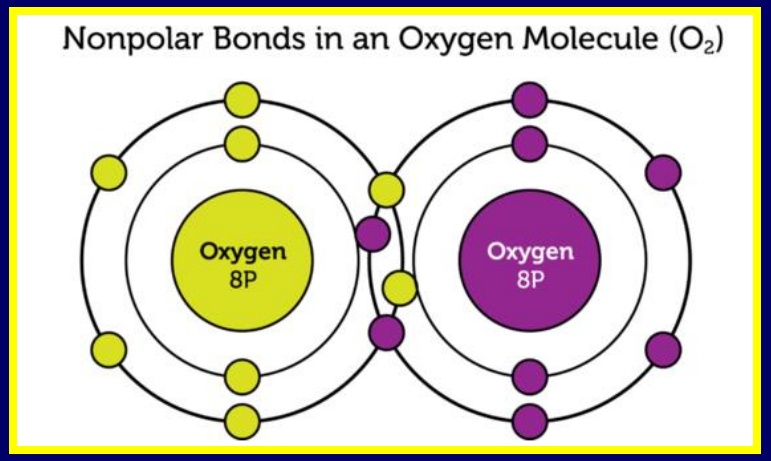


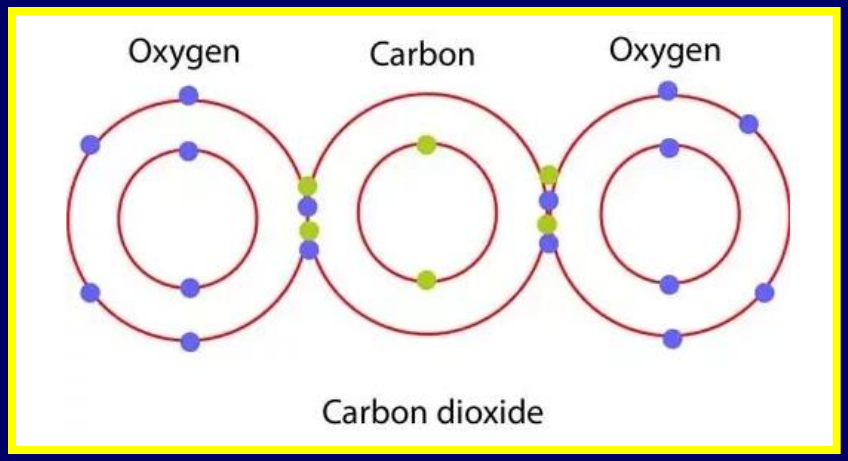


The means the electrons will spend an equal amount of time around the nucleus of both atoms.

Nonpolar Molecules

When molecules share the electrons equally, they are said to be nonpolar molecules.

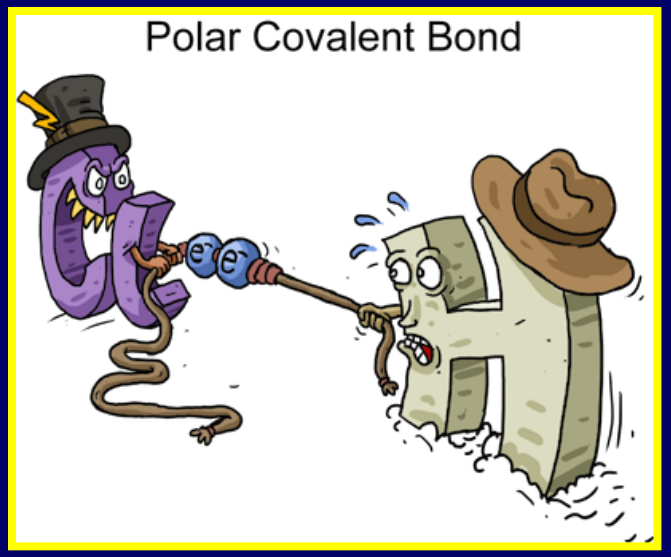


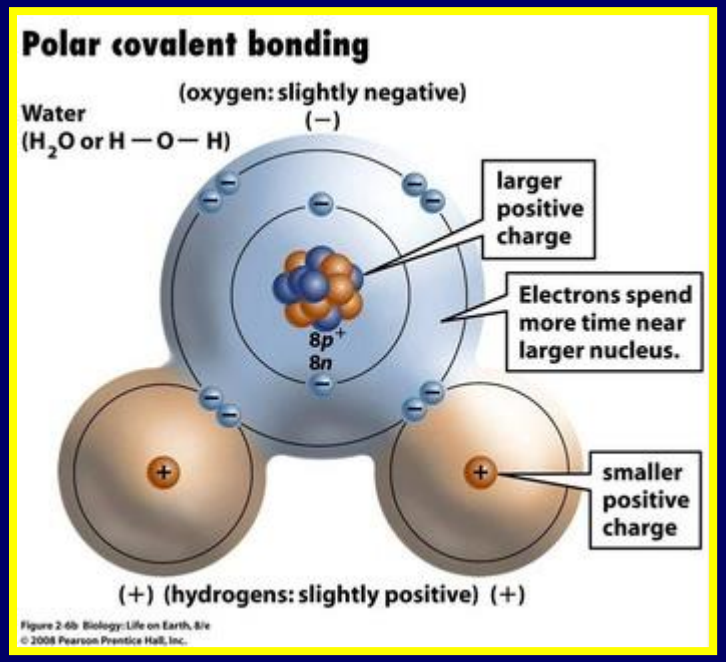


Nonpolar molecules tend to made up of the same atoms bonded together or atoms that are about the same size.

Unequal Sharing

Sometimes, the atoms in covalent molecules, do not share the atoms equally.

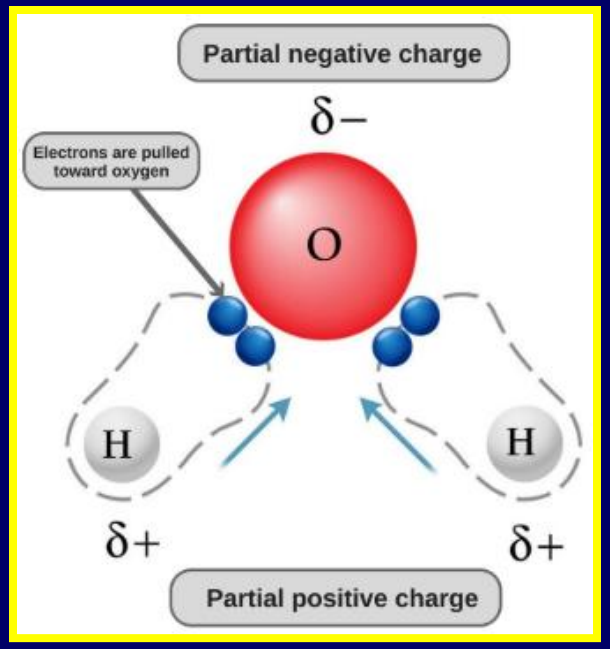




This means the electrons will spend more time around one of the atoms than the other atoms.

Polar Molecules

The atom in which the electrons tend to stay around develops a slight negative charge.

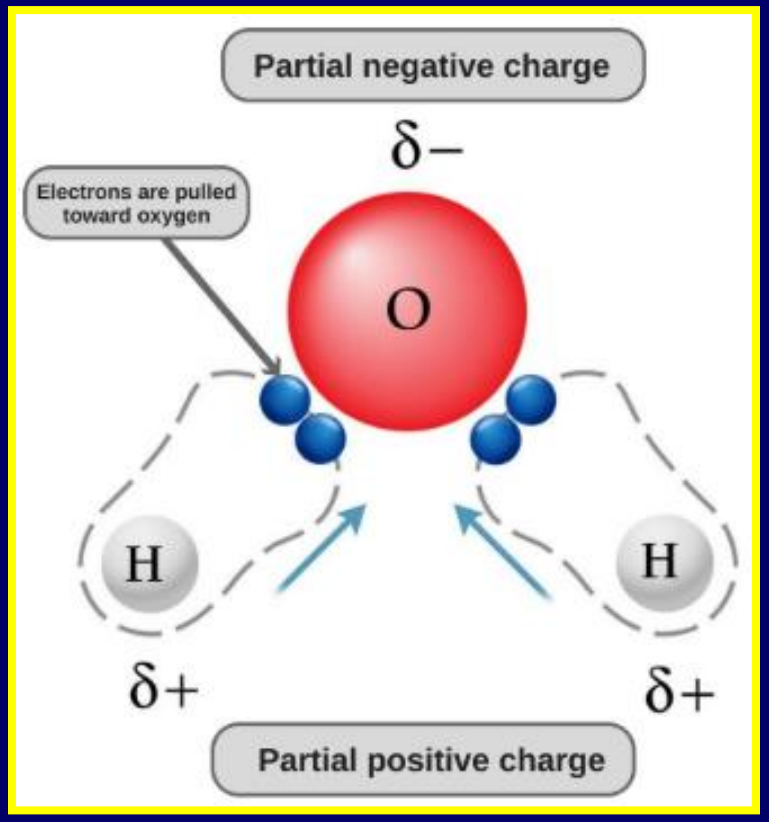


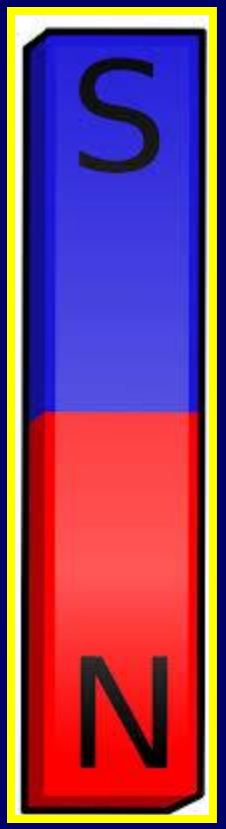
The atom in which the electrons do not tend to stay around develops a slight positive charge.

The symbol δ stands for slight, meaning that it is not fully positive or fully negative.

Polar Molecules

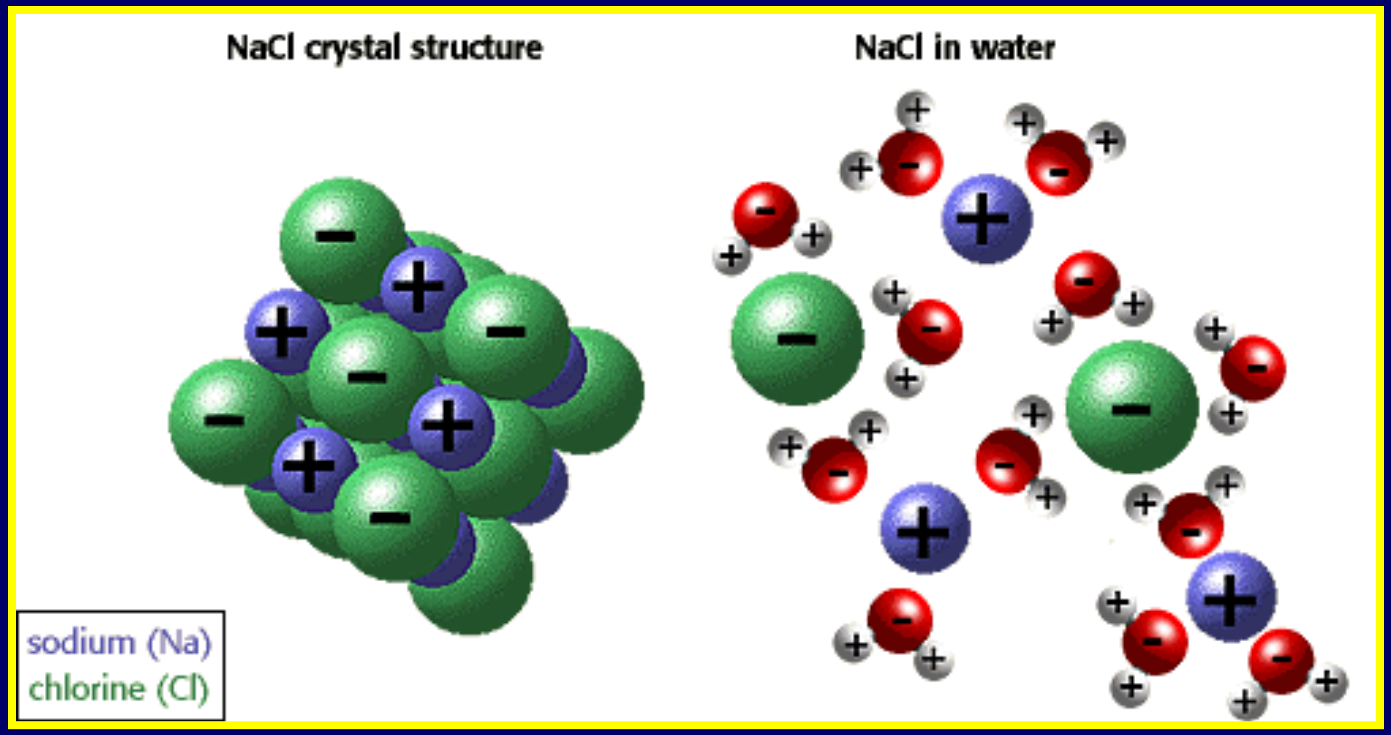
Polar molecules have oppositely charged ends, just like the two poles of a magnet.





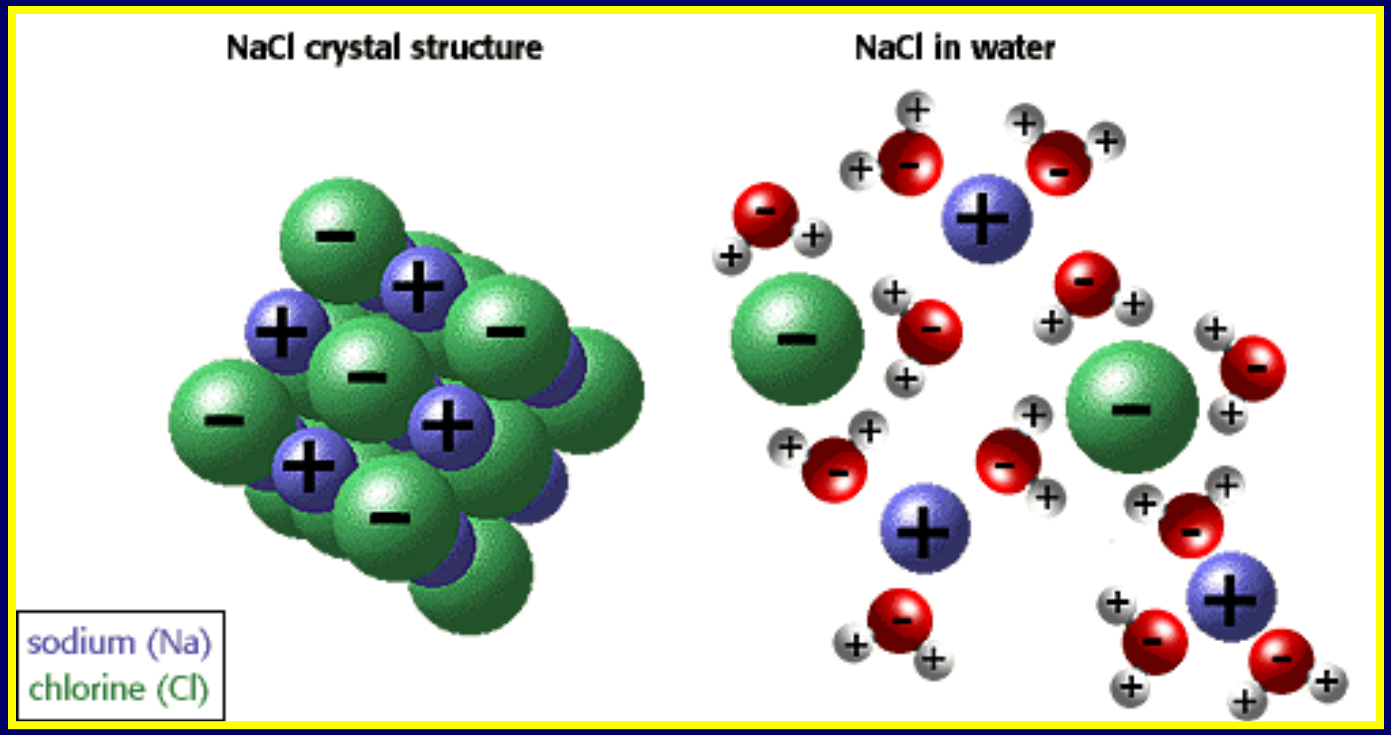
Polar Dissolves Polar

When salt is placed in water, the negative oxygen atoms from the water molecule are attracted to the positive sodium atoms in the salt compound.



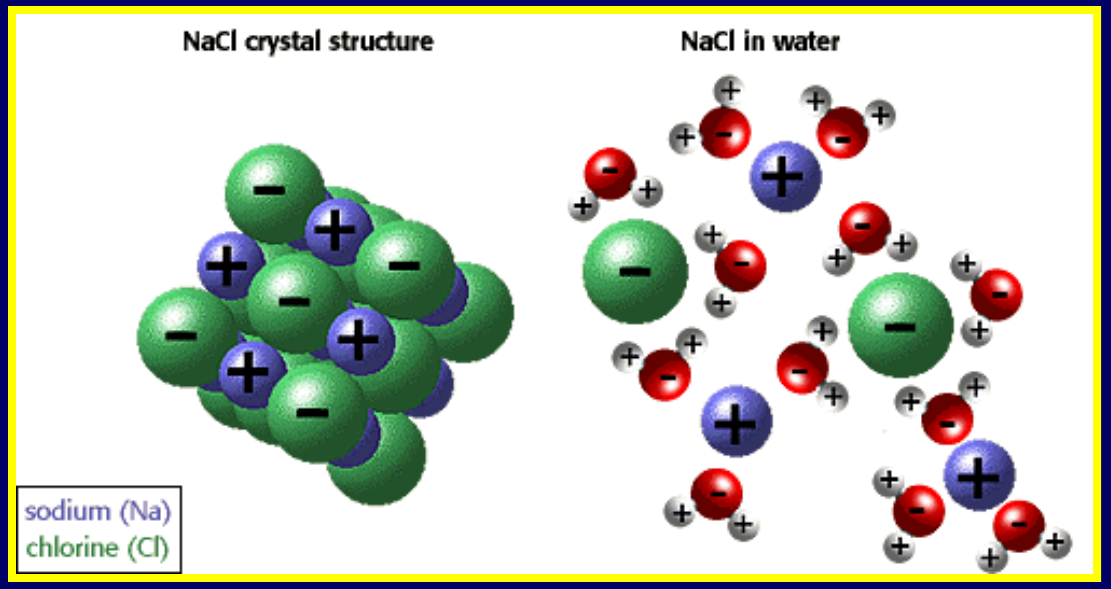
Polar Dissolves Polar

Likewise, the positive hydrogen atoms from the water molecule are attracted to the negative chlorine atoms in the salt compound.



Polar Dissolves Polar

Overtime, the sodium and chlorine atoms are pulled apart and dissolved.

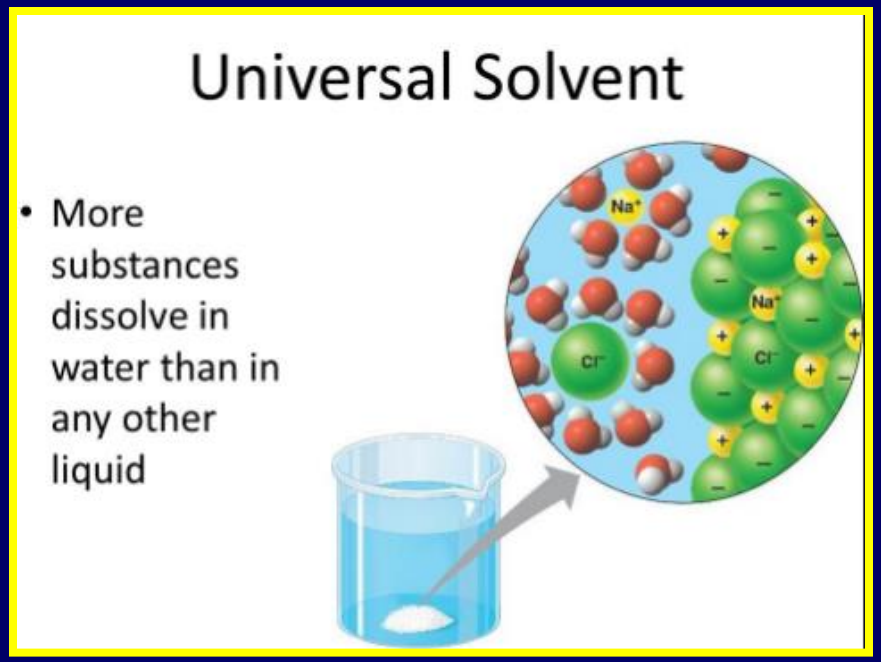


Keep in mind that dissolving is a physical change, not a chemical change.

The water and salt just becomes mixed together and no new substance is produced.

Universal Solvent

Because there are so many more polar covalent molecules and ionic compounds, the polar water molecule can dissolve more substances than any other liquid.



That is why water to said to be a universal solvent and why we use it for washing things.

Nonpolar Molecules

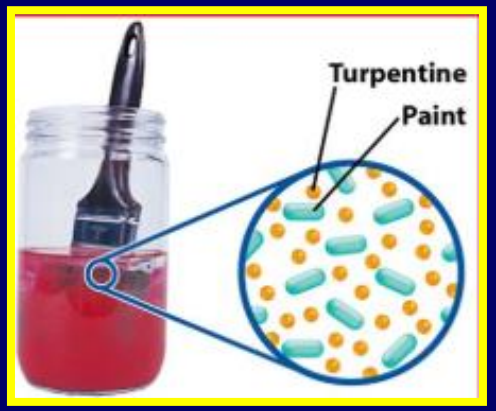
But water cannot dissolve everything.

For example, water cannot dissolve lipids, like oils and fats because they are nonpolar and there is no electrical attraction.

Nonpolar Molecules

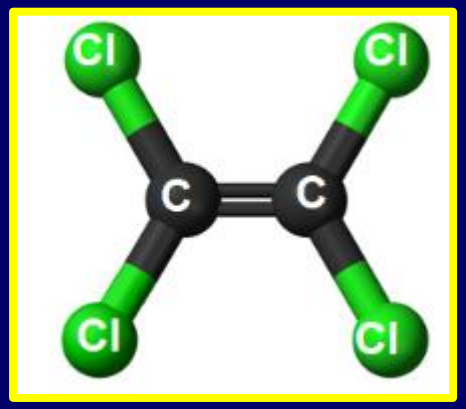
Non-polar molecules will only dissolve in a non-polar solvent

For example, paint brushes used with oil-based paints can only be cleaned with nonpolar paint thinners like turpentine.



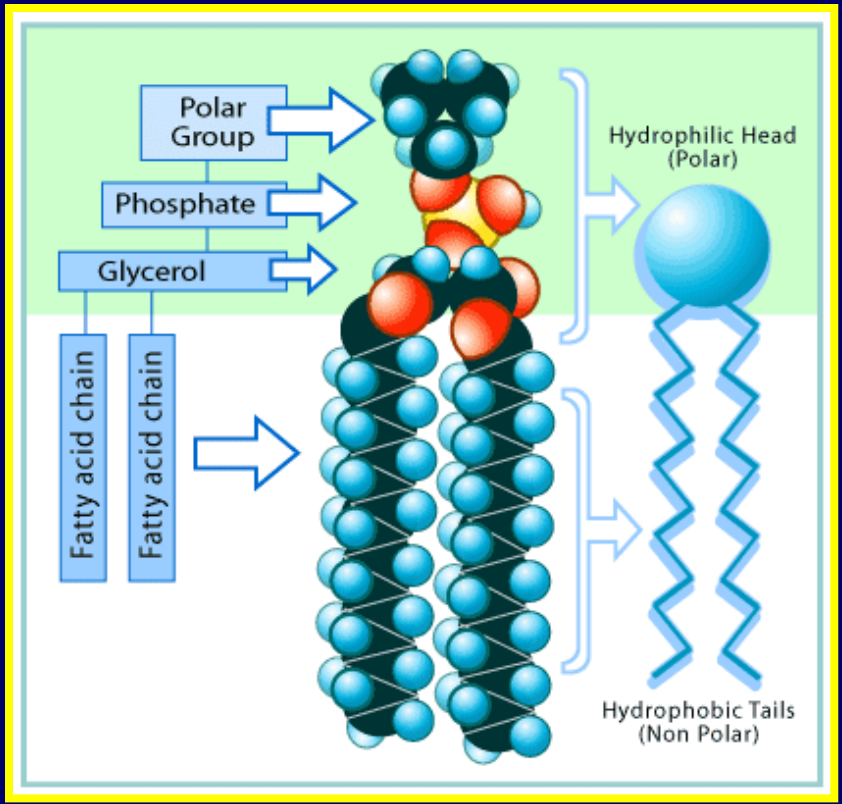
Dry Cleaning

Dry cleaners use a non-polar solvent, called Perchloroethylene, to clean clothes without the use of water.



Phospholipids

Phospholipids that make up cell membranes have polar heads and non-polar tails.

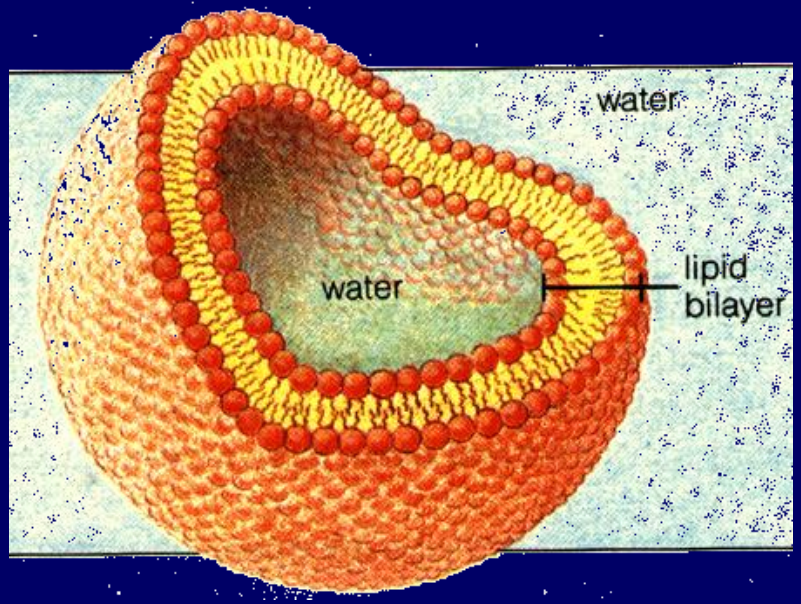


The polar phosphate head is attracted to polar water molecules, so it is called hydrophilic, meaning water liking.

The nonpolar lipid tails are not attracted to polar water, so they are called hydrophobic, meaning water fearing.

Phospholipids

Recall that our bodies, including our cells are mostly made up of water.

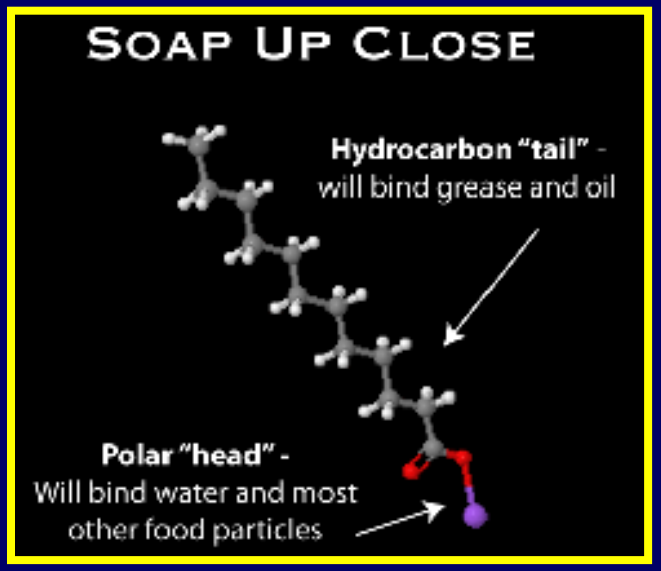


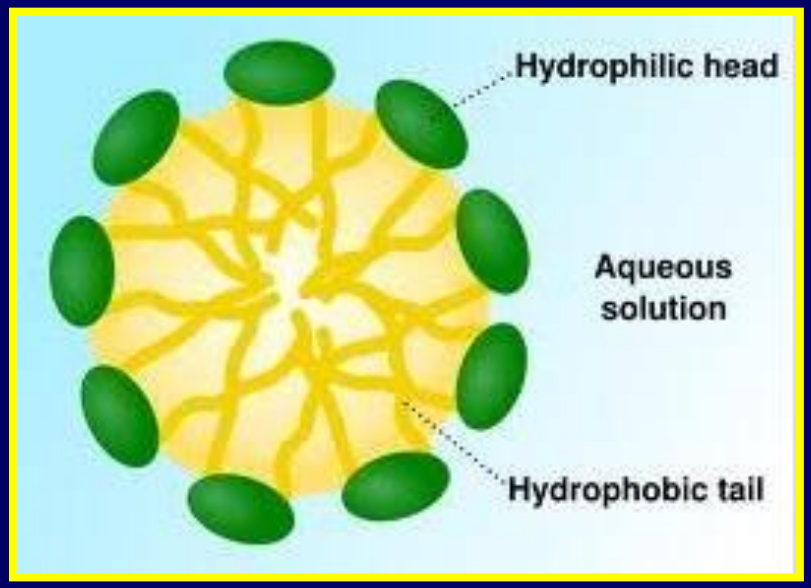
When phospholipids come in contact with water, the phosphate head turns towards the water and the lipid tails turn away from the water.

This results in a lipid bi-layer of phospholipids that surround the cells, called the cell membrane.

How Soaps Work

Soap is very similar to a phospholipid in that it also has a polar head and nonpolar tail.

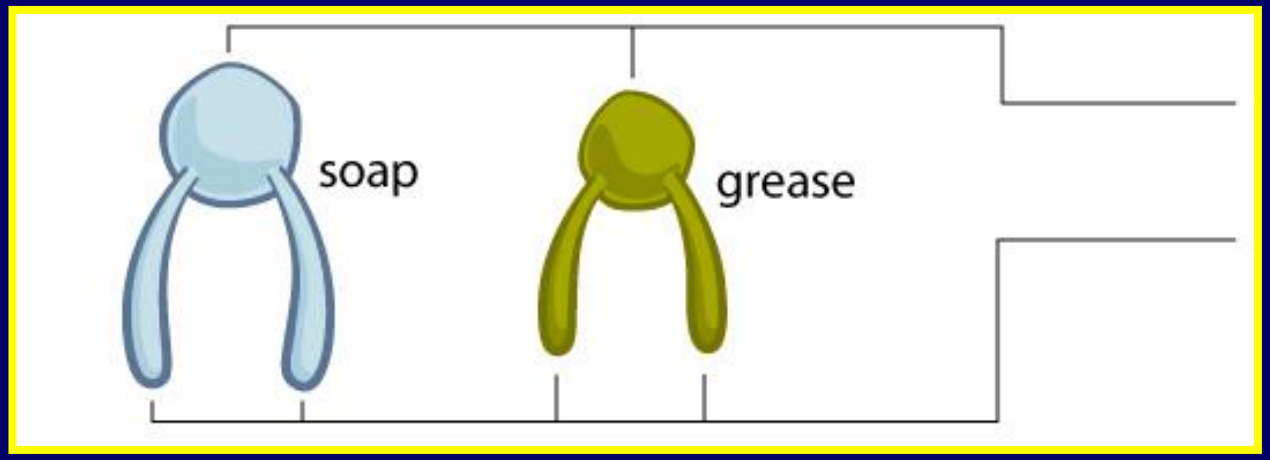




When soap encounters water the nonpolar hydrophobic tails turn away from the water and the polar hydrophilic heads turn towards the water, forming a soap bubble.

How Soaps Work

Grease, being a lipid, also contains a polar hydrophilic head and a nonpolar hydrophobic tail, very similar to soap.

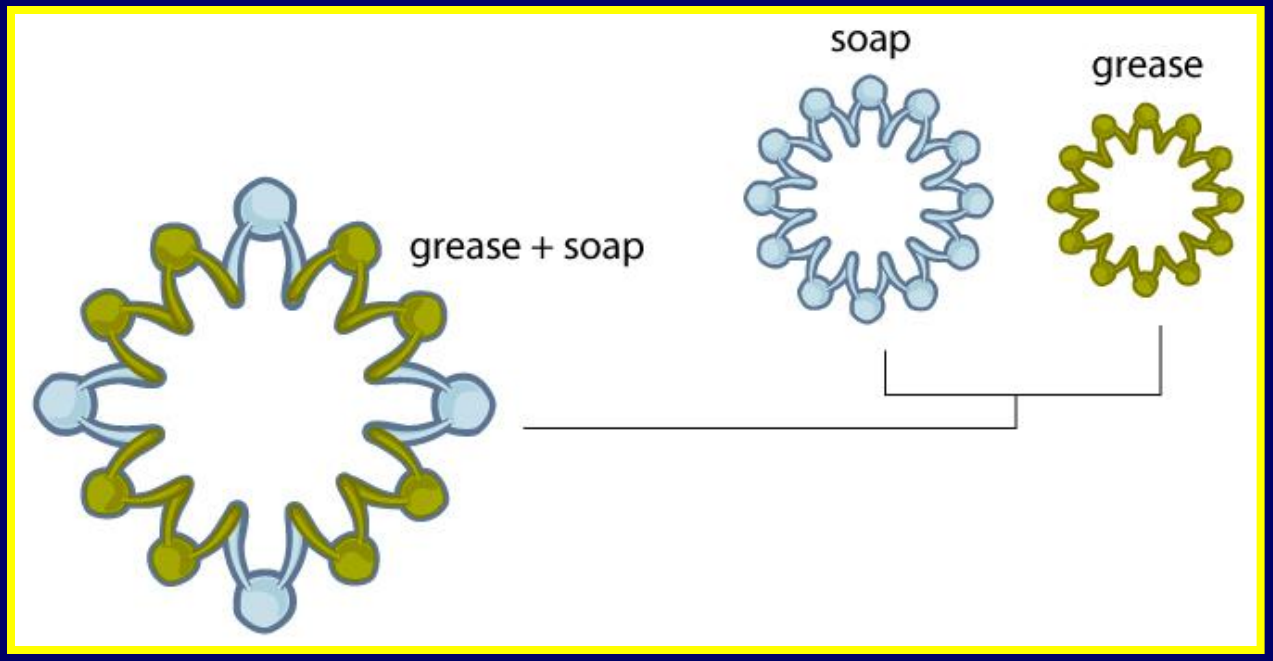


Hydrophilic
Polar Heads

Hydrophobic
Nonpolar Tails

How Soaps Work

Because grease and soap are so similar, when placed in water, the two combine to form one bubble which can then be washed away.



The End


But bears are insoluble.
Help! Help! I'm dissolving
That's easy for you to say... you're not polar!